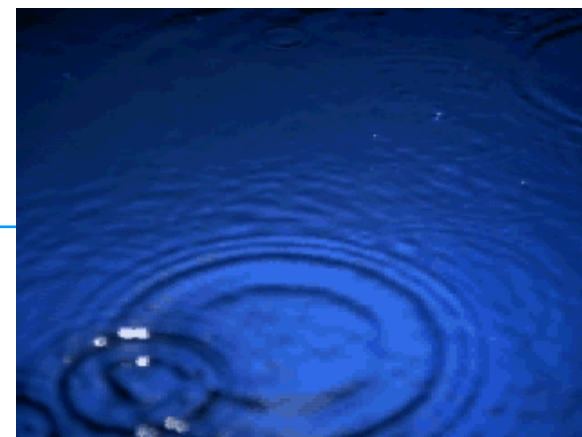


Global Precipitation Measurement

System Requirements Review Precipitation Processing System



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- *Overview of trade studies conducted*
- *System approach adopted*
- *PPS system concept*
- *PPS architectural properties*
- *Types of data products produced*
- *Driving Requirements*
- *Requirements on PPS from other mission elements*
- *Requirements by PPS on other mission elements*
- *Risks*
- *Schedule*



Level 1 Requirements

Mission: * Measurement * Validation * Products * Duration	Instrument: * Space Based * Ground Based
* Launch * Science Data System * Science Products * Descope	* Operations * Public Outreach

Level 2 Requirements

Science: * Storm Types * Precip Types * Measurements * Coverage * Frequency & Accuracy	Mission: * Data Handling * Payloads * Constellation Design * Calibration & Verification * Outreach
* Launch Services	* Process Requirements
Space Segment: * Instruments - DPR - GMI - Opportunity * Primary Spacecraft - Performance - Accommodation * Constellation Spacecraft - Performance - Accommodation	Ground Segment: * NASA Mission Operations - S/C Flight Ops - Space/ Ground Coordination * Ground Validation & Calibration - Super Site - Regional Rain Gauge Network * Precipitation Processing System - Product Development - Data Distribution

Other Sources

- * Formulation Study Results
- * Science Workshops
- * GSFC Guidelines

Precipitation Data Processing Requirements:

- Precipitation Measurement Synthesis
- Product Definition
- Data Processing Capacity and Operations
- Instrument Data Handling
- Data Archiving and Distribution
- Ground Validation Coordination

- Precipitation Measurement Synthesis [6.2.1]
 - Used for the calibration transfer standard between primary and constellation s/c
- Product Definition [6.2.2,-3,-4]
 - This is the output of the GPM mission
- Open Architecture [6.2.5]
 - What is wanted is the ability to make incremental improvements
- Processing Capacity [6.2.6]
 - Makes sure the system is big enough to do the job
- Instrument Data Handling [6.2.7]
 - Defines the handling of raw data into and within the PPS
- Ground Validation [6.2.8]
 - Coordinate overpass and co-observations
- Data Processing Operations [6.2.9]
 - Handle all the data within the latency req's
- Data Archiving and Distribution [6.2.10]
 - Makes sure the proper people have their data in a timely manner

- **Overall System Architecture**

- Centralized with all processing from Level 0 done at GSFC
- Distributed and “Federated” processing through Level 1B done by partner systems with PPS creating global combined products

- **System Delivery Paradigms**

- Fresh Build
- MODAPS approach – strongly tied to Earth Observing System (EOS) Data Information System (EOSDIS) EOSDIS Core System (ECS)
- TRMM Data Information System (TSDIS) – weakly tied to EOSDIS V0
- CloudSat (Colorado State University) – PI based ESSP system

- **Technical Topics**

- Impact and interactions with Strategic Evolution Earth-Science-Enterprise Data Systems (SEEDS) on PPS
- GPS vs Ephemeris based geolocation and geolocation tools for Level 1B processing
- Data Formats
 - Logical data schemas
 - Physical format representations
- Data Volume and Storage evolution
- Beowulf parallel computing systems



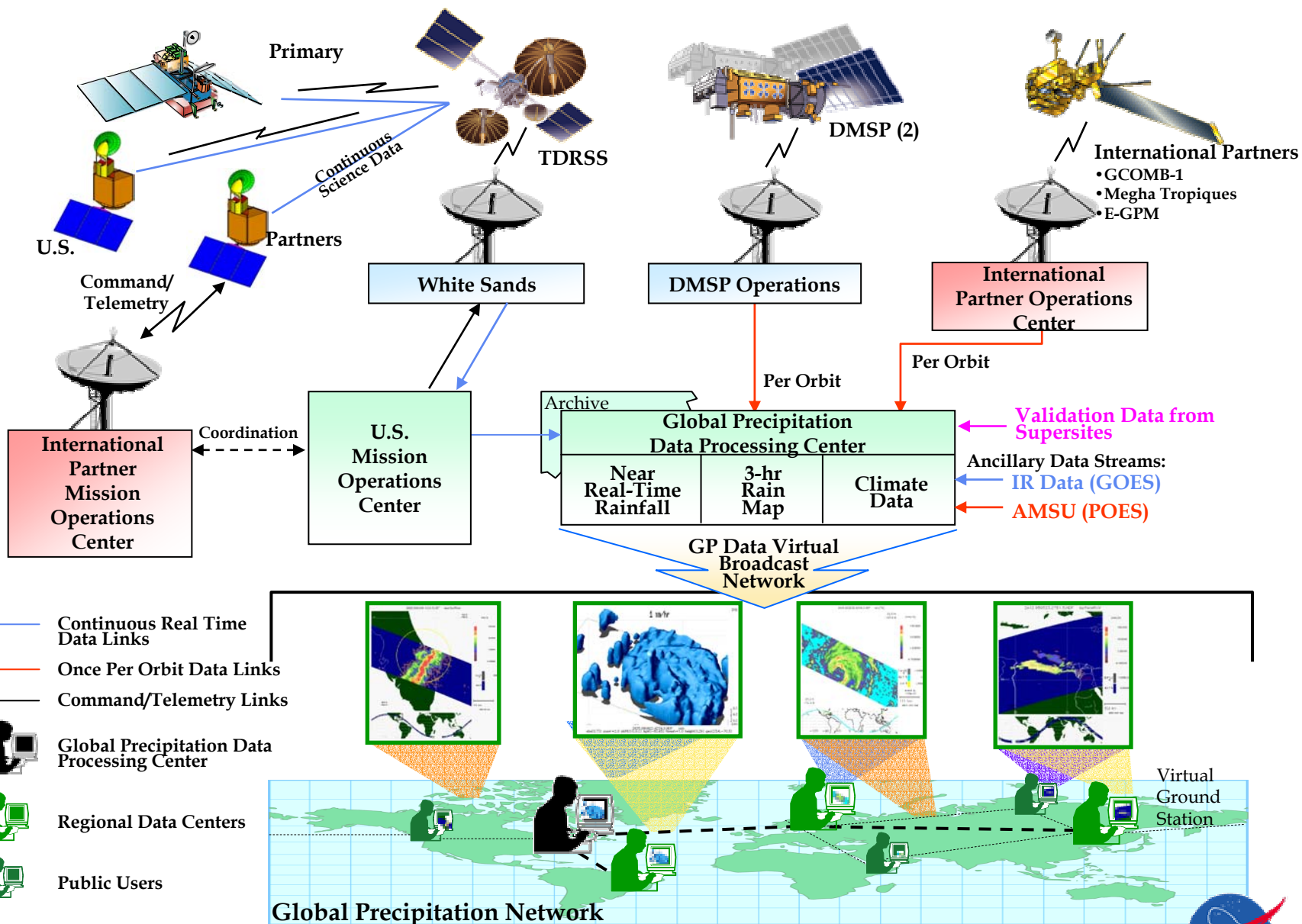
- ***Overall System Architecture***

- *Geographically distributed*
- *Major partner role in the provision of data through Level 1b and algorithms*
- *Federated approach (interchange through published ICD's)*

- ***Delivery Approach Adopted***

- *Science team led processing system loosely coupled with EOSDIS*
- *Large-scale reuse of TSDIS*
- *Close connection with SEEDS activities*





- *PPS shall have an open architecture (6.2.5)*
 - *This is strictly defined in requirements to allow easy modification of algorithms without perturbing the rest of the system*
- *PPS should be scalable both to support larger and smaller processing environments*
- *PPS should be able to add additional processing threads from other potential partners/missions with only “incremental” or no software costs*
- *PPS software should be portable and able to run on a variety of different platforms without requiring major revision*
- *PPS architecture/software should be flexible and allow the insertion of new or different processing streams without requiring major software revision*

- ***Outreach near real-time rain-map product***
 - *Global rain-map image created from brightness temperatures from mission radiometers*
 - *Availability time dependent upon the source of the Level 1B – brightness temperature data*
 - *TDRSS continuous mode data – appropriate rainmap image areas updated every 10mins from all data at hand*
 - *Orbital products – appropriate rainmap areas updated within 10 mins of receiving all necessary well-calibrated, well-geolocated Level 1b products from partners*
- ***3-hr global rainfall near real-time products for applications***
 - *Availability on server within 30 minutes of receiving all required input for generating a global 3 hr product*
 - *Multiple sources: data obtained through TDRSS continuous access, Level 1B provided by national and international partners*
- ***Research quality Precipitation Products***
 - *Swath oriented products (geolocated and calibrated) containing instrument values*
 - *Swath oriented products containing geo-physical precipitation data*
 - *Time-sampled, spatially gridded precipitation data*
 - *Available for distribution within 48 hours of receiving all required input data for production*

- *Production of 3hr global near real-time applications products (6.2.9.2)*
- *Synthesis of radiometer measurements (6.2.1)*
- *Ground Validation software for error characterization (6.1.3.3)*
- *Full Resolution Pixel Tables (6.2.4)*



- *PPS shall provide overpass information for all GPM spacecraft to GPM validation sites*
 - *Predictive information over a 7 day period (6.2.8.3)*
 - *Definitive information on day before overpass (6.2.8.4)*
- *PPS shall provide overpass satellite data to GV processing centers within an hour of their production (6.2.8.6)*
- *PPS shall transmit data products to GSFC DAAC*
 - *6.2.10.1 (latency)*
 - *6.2.10.2 (DAAC designation)*
- *PPS shall distribute data to the GPM Science Team (6.2.10.4)*
- *PPS shall make available all data to GPM partners (6.2.10.5)*



- *GV team shall provide software to process error characterization data to the PPS (6.1.3.3)*
- *GV sites shall produce a weekly report of bias and bias uncertainty vs rain-rate and send to PPS (6.1.3.1)*
- *Mission operations shall provide science data routinely to the PPS (6.2.7.2 & 6.3.1.5)*
- *Science data files from mission operations shall contain (5.3.15.10)*
 - *Spacecraft time*
 - *x,y,z spacecraft location in Earth Centered Earth Fixed format*
 - *Latitude and longitude and height information*
- *Science team shall provide all algorithm code required to produce swath products in a format established by an ICD.*
- *Science team shall provide all algorithm code required to produce gridded products that require more than mathematical summarization and gridding in a format established by an ICD*

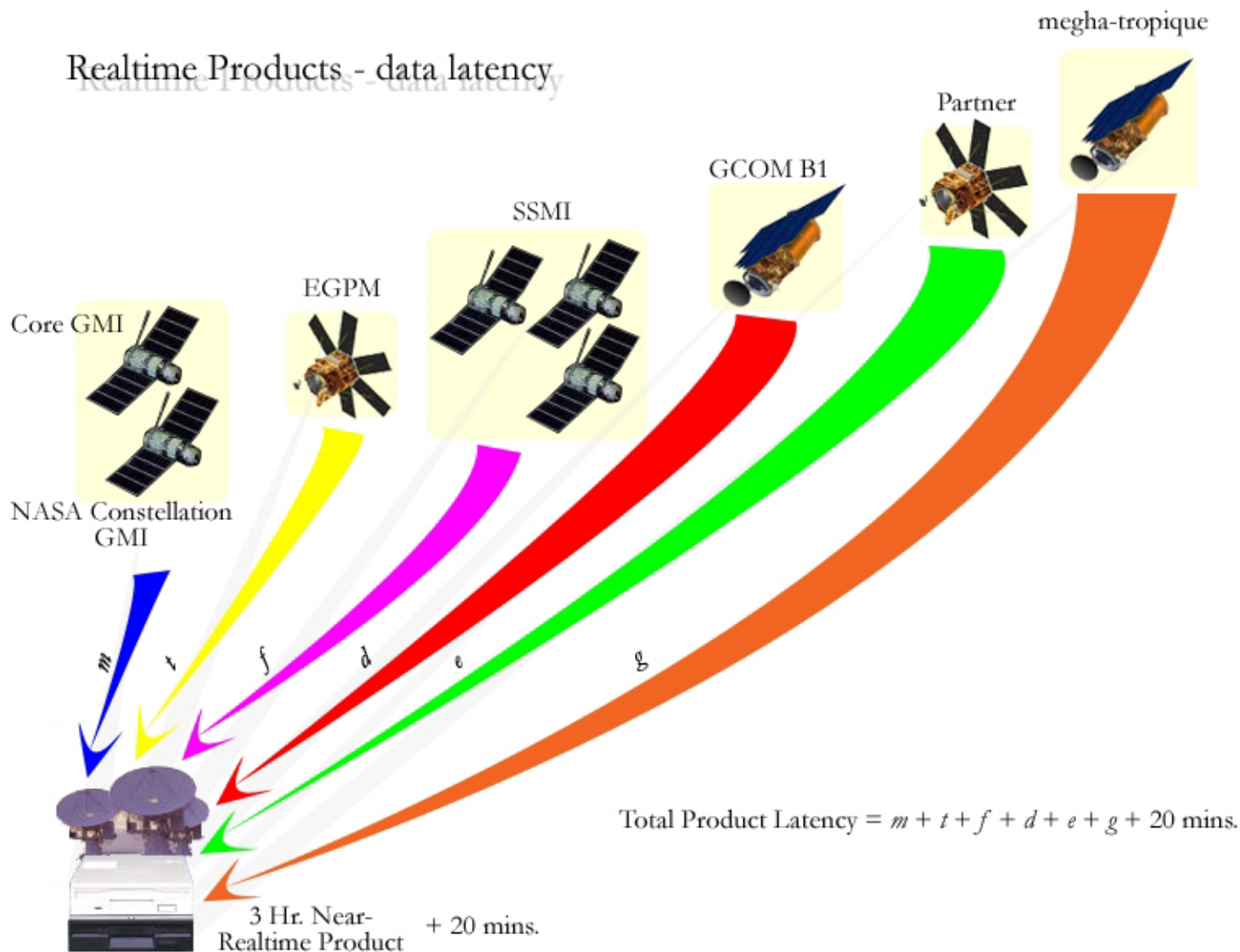
- ***International Partnership Agreements***

- *Network connectivity*
- *Data Availability*
- *Geolocation and Calibration*
- *Data content (format)*
- *Data exchange formats*
- *Interface control documents*

- ***Global Product Production for near realtime application product***

- *Data latency of level 1B brightness temperature products from partner facilities*
- *Science algorithm to merge data meaningfully from*
 - *Dissimilar sensors*
 - *Various resolutions*
 - *Various footprints*





Precipitation Processing System

Summary Schedule

5/2/02

